

Passive scalar transport by random waves.

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Oceanic wave motions on scales from capillary to planetary are usually characterized by rather broad spectra resulting from nonlinear wave-wave interactions. These wave motions have long been suspected to facilitate "turbulent diffusion" of heat and other scalars. Assuming waves to be at most weakly nonlinear, we derive the diffusion equation for the mean concentration field and compute the effective diffusion constant. The general theory is then applied to estimate turbulent transport due to baroclinic inertia-gravity waves and due to wind-generated surface gravity waves on deep water. Comparisons with conventional, eddy-induced diffusion are provided.